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Emotional regulation difficulties in migraine patients: Do they link with clinical features of migraine and pain-related disability?

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Abstract
This study aims to elucidate the emotion regulation difficulties (ERD) in migraine sufferers compared to a healthy control group. We intend to explore the correlation between ERD and migraine-related factors like pain intensity, duration, and associated disability. Additionally, the study seeks to identify key determinants influencing disability in migraine patients, thereby contributing to a deeper understanding of the interplay between clinical migraine characteristics and ERD.
Material and Methods: We conducted the research on 70 patients suffering from migraines and 66 healthy individuals. We administered the Structured Questionnaire Form, the Difficulties in Emotion Regulation Scale Short Form, the Migraine Disability Assessment Scale, and the Visual Analog Scale to both groups. We analyzed the data using the statistical program SPSS 25.0.
Results: The total Emotion Regulation Difficulty (ERD) score among migraine patients ($p = 0.030$) demonstrated a significant increase compared to that of the healthy control group. Furthermore, our analysis revealed no significant correlations between ERD and various migraine-related factors, including pain severity ($r = -0.093$), duration ($r = 0.082$), frequency ($r = 0.095$), or disability ($r = 0.021$) among migraine patients. Notably, our findings indicate that the severity and frequency of headaches in migraine patients collectively account for 24% of the variability observed in disability scores.
Discussion: Migraine patients are more likely to experience ERD. Psychiatric complaints in migraine clinics may be linked to ERD. Therefore, recognizing ERD in migraine patients, identifying potential factors associated with ERD, and addressing them are expected to impact the prognosis of the disease positively.

Keywords
Migraine, Emotion Regulation, Headache, Disability

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Introduction

Migraine is a primary type of headache in which severe, unilateral, and pulsatile pain is generally observed. It is associated with nausea, vomiting, phonophobia, photophobia, and various combinations of auras [1]. Migraine affects patients' occupational and social lives and causes functional loss. According to the Burden of Disease Study (2015), supported by the World Health Organization, migraine is the 7th among all diseases causing disability and takes the first place among the neurological diseases causing disability [2]. The study also revealed that among individuals under the age of 50, migraine ranked third among all illnesses in terms of disability, with pain being the primary contributing factor [3].

Emotion regulation is a multifaceted process that encompasses a diverse range of internal and external mechanisms. These mechanisms work in concert to monitor, assess, and modulate emotional responses to achieve desired outcomes [4]. In this context, emotion regulation difficulties (ERD) can be categorized into the following: inability to understand emotional responses (clarity), inability to accept emotional responses (non-acceptance), lack of awareness of emotions (awareness), difficulty in impulse control during negative emotional experiences (impulse), difficulty in focusing on goal-directed behavior during negative emotional experiences (goals), and difficulty in accessing appropriate emotion regulation strategies (strategy) [5].

Neurobiological research links pain to emotion through the central nervous system's synaptic connections, influencing pain sensitivity, which is the modulation of pain perception by emotions and vice versa. While the pain-negative emotion nexus is acknowledged, the impact of emotion regulation styles on pain and disability is still unclear. Emerging studies suggest poor emotion regulation is a risk factor for chronic pain [6]. Numerous studies have examined the relationship between migraine patients and their moods, with findings indicating a higher prevalence of negative moods in individuals with migraines. A study has revealed that individuals with migraines, in comparison to healthy individuals, exhibit increased neural activity in response to negative emotional stimuli [7]. Additionally, they tend to employ ineffective coping strategies and are more prone to experiencing psychiatric pathologies such as depression [8]. One of the possible reasons for these negative emotional experiences common in migraine patients is deficient emotion regulation skills. The role of ERD in migraine disease is not fully understood, and there is a paucity of research in this area. Haratian et al. (2020) compared ERD in headache patients and a control group, finding higher ERD in headache patients, particularly in those with tension-type headaches compared to migraine sufferers [9].

Migraine, characterized by prominent clinical symptoms such as negative emotions and pain, is considered a cause of disability. As disability is a global public health issue, it is essential to identify factors associated with disability in different disease groups, including migraine. Studies investigating the relationship between migraine and disability often highlight the frequency and duration of pain attacks and negative moods [10, 11]. However, no study has examined the role of ERD in this context. There are a limited number of studies on ERD in pain-related illnesses; for instance, individuals with rheumatoid arthritis have been found to struggle with the regulation of their emotional expressions, potentially leading to mental and physical issues associated with pain severity [12]. Conversely, patients with fibromyalgia who freely express their emotions tend to exhibit milder physical symptoms and report fewer missed days of work [13].

The etiology and prognosis of migraines are influenced by both psychological and biological factors; however, many aspects of this relationship remain poorly understood. One of the primary reasons for these uncertainties is the complex interplay between pain and emotion. The clinical characteristics of migraine and the developing degree of disability may be related to ERD experienced by the patient. Our first aim in this study is to investigate ERD in migraine patients. Secondly, we aim to examine the effect of ERD on the clinical features of migraine and disability.

Material and Methods

In our case-control investigation, we aimed to elucidate the disparities between migraine sufferers and healthy individuals. Patients with migraines, presenting with headaches at the Neurology Clinic of Karatay University's Medical Faculty Hospital, were enrolled in the study. These patients were diagnosed with migraines by a qualified neurologist according to the International Classification of Headache Disorders (ICHD-3) criteria. Concurrently, a control group of demographically similar healthy individuals was included, comprised of hospital staff, patients' relatives, and university students. The inclusion criteria for both cohorts emphasized an age range of 18-65, voluntary participation, provision of informed consent, and the absence of any physical or psychiatric conditions that might affect the validity of the assessment tools. Data collection was carried out from March to October of the specified year. For the migraine cohort, a Structured Questionnaire Form was used to capture demographic details and clinical characteristics relevant to their condition. The Difficulties in Emotion Regulation Scale - Short Form (DERS-16), a 5-point Likert-type scale developed by (5) and subsequently adapted to a brief form by [14], was utilized to measure difficulties in emotion regulation, with its Turkish validation and reliability established by Yiğit and Guzey Yiğit [15]. Pain severity was assessed using the Visual Analog Scale (VAS), and the Migraine Disability Assessment Scale (MIDAS), validated in Turkish by Ertaş et al. [16], was used to measure disability due to migraines. The MIDAS, comprising seven open-ended questions about the frequency of pain attacks over the past three months, assigns cumulative scores that classify the level of disability into four grades, from Grade 1 (minimal or no disability) to Grade 4 (severe disability). The healthy control group was also assessed using the same Structured Questionnaire Form and DERS-16 to collect sociodemographic data.

Statistical Analysis

The data analysis was conducted using SPSS 25.0. Sociodemographic characteristics were assessed using descriptive statistics, and following the assessment of normal distribution conformity, parametric tests were applied. Statistical analyses were carried out at a 95% confidence

interval with a significance level of p < .05. The Student's t-test was used for comparing differences between two groups, ANOVA for multiple group comparisons, Pearson correlation for the strength and direction of relationships, and hierarchical regression analyses to examine the predictive power of independent variables on the dependent variable.

Ethical Approval

Ethics Committee approval for the study was obtained. This study was approved by KTO Karatay University's Ethics Committee of Pharmaceutical and Non-Medical Device Research (Date: 2021-03-11, No: 2021/001).

Results

Participants

In our study, we worked with 70 migraine patients and a control group consisting of 66 participants. No significant differences were found between the groups in terms of gender (p=.129), educational status (p=.410), marital status (p= .081), employment status (p= .347), and age (p= .241). Both groups participating in the study had similar demographic characteristics.

When evaluating migraine patients in terms of attack characteristics, 35.7% of the participants reported that the onset hours of their attacks were irregular, 44.4% indicated that the duration of their attacks was between 5-8 hours, and 58.6% stated that they experienced attacks between 1-3 times a month. In assessing the factors that trigger and worsen migraine attacks, it was determined that the participants' attacks were primarily associated with emotional changes.

This was followed by fatigue, bright lights, and insomnia, respectively. According to MIDAS scores used to measure disability due to migraine, 28.6% of migraine patients had grade 1 (no or very little loss), 21.4% had grade 2 (mild loss), 17.1% had grade 3 (moderate loss), and 32.9% were identified as grade 4 (advanced loss). The average MIDAS score of the participants was determined to be 19.10 days.

According to the independent samples t-test results, the DERS-16 scores of migraine patients were found to be significantly higher than controls (t=2.198, P<.05). When the DERS-16 subscales were evaluated with t-tests for independent samples, the subscale score for rejection was found to be significantly higher in migraine patients than controls (t= 2.157, p<.05). There was no significant difference between the groups on the clarity, goals, impulses, and strategies subscales. The evaluation data are presented in Table 1.

When the socio-demographic characteristics of the migraine group with ERD were evaluated, it was found that ERD did not differ according to gender, educational status, marital status, income level, and work status. At the same time, no relationship was found between ERD and age (r=-.110), pain intensity (r=-.093), frequency of pain (r=.095), and duration of pain (r=.082). To determine the relationship between ERD and disability in migraine patients, the Pearson Correlation test was performed,

Table 1. t-test analysis of the DERS-16 scores of migraine and control groups.

DERS-16 scores	Groups	N	Mean	SD	t	P
DERS 16-Total	Migraine	70	39.94	8.86	2.198	.030*
	Control	66	36.16	11.11		
Clarity	Migraine	70	4.72	1.43	0.969	.334
	Control	66	4.45	1.85		
Goals	Migraine	70	9.34	2.66	1.037	.302
	Control	66	8.85	2.92		
Impulse	Migraine	70	7.Mar	2.60	1.621	.107
	Control	66	6.30	2.61		
Strategies	Migraine	70	8.94	3.19	1.756	.081
	Control	66	9.91	3.67		
Non-Acceptance	Migraine	70	6.70	2.42	2.157	.033*
	Control	66	5.80	2.42		

DERS-16: Difficulties in Emotion Regulation Scale, SD: Standard Deviation *P<0.05

Table 2. One-Way ANOVA analysis MIDAS scores – DERS-16 scores in migraine patients

	MIDAS Scores	N	Mean	SD	F	P
DERS-16 Total	1st-grade	20	40.75	6.82	.879	.457
	2nd-grade	15	41.67	9.16		
	3rd-grade	12	41.08	11.10		
	4th-grade	23	37.52	9.03		
Clarity	1st- grade	20	4.80	1.15	.119	.948
	2nd-grade	15	4.87	1.46		
	3rd-grade	12	4.67	1.61		
	4th-grade	23	4.61	1.62		
Goals	1st- grade	20	8.40	1.96	1.456	.235
	2nd-grade	15	9.27	3.08		
	3rd-grade	12	9.75	2.89		
	4th-grade	23	10.00	2.63		
Impulse	1st-grade	20	7.45	2.19	2.076	.112
	2nd-grade	15	8.13	2.77		
	3rd-grade	12	6.50	3.48		
	4th-grade	23	6.22	2.09		
Strategies	1st-grade	20	10.25	2.45	.388	.762
	2nd-grade	15	10.20	4.04		
	3rd-grade	12	10.25	3.00		
	4th-grade	23	9.35	3.34		
Non-Acceptance	1st-grade	20	7.50	2.66	.388	.044*
	2nd-grade	15	7.00	2.10		
	3rd-grade	12	7.17	2.21		
	4th-grade	23	5.56	2.21		

DERS-16: Difficulties in Emotion Regulation Scale, SD: Standard Deviation, MIDAS: Migraine Disability Assessment Questionnaire *P<0.05

Table 3. Hierarchical regression analysis of headache frequency, migraine attack duration, and pain severity in migraine patients to predict disability.

	Variables	B	SE	β	T	P
Model 1	Constant	-.469	7.874		-.060	.953
	Headache frequency	9.293	2.997	.363	3.101	.003*
R2= .13	Duration of migraine attack	-.531	2.284	-.027	-.232	.817
Model 2	Constant	-11.313	8.176		-1.384	.171
	Headache frequency	7.228	2.894	.282	2.497	.015
R2= .24	Duration of migraine attack	-1.527	2.171	-.078	-.703	.484
	Severity of migraine attack (VAS Score)	2.875	.919	.351	3.217	.003*

SE: Standard error, *P<0.05

and no relationship was identified (r=.021). The mean scores obtained from DERS-16 according to the grade of disability were analyzed by one-way ANOVA. A statistically significant difference was found between MIDAS grades in the non-acceptance subscale. As a result of Tukey HSD analysis, it was determined that patients with 4th-grade disability in MIDAS grades had significantly lower scores than patients with 1st-grade disability. The data are presented in Table 2.

In a regression analysis assessing factors affecting MIDAS scores, preliminary correlations showed variable relationships below the .80 threshold, indicating suitability. Durbin-Watson and VIF metrics were within acceptable limits. Model 1 found that headache frequency and migraine duration positively influenced MIDAS scores, while migraine duration's impact was statistically insignificant (R^2 = .13, F = 4.92, p < .05). Introducing pain intensity (VAS Score) in Model 2 significantly improved predictive power for MIDAS scores, with an R^2 increase of 11% to .24 (F = 6.97, p < .05). This model demonstrated that headache frequency and pain severity explained 24% of variance in migraine-related disability, with each unit increase in these factors raising MIDAS scores by .28 and .351, respectively.

Discussion

Our study concluded that migraine patients experience more ERD, but ERD does not affect disability in this patient group. At the same time, no relationship was found between the clinical characteristics of migraine and ERD. When migraine patients were stratified according to the extent of their disability, it was found that migraine patients' controls differed only in the DERS-16 non-acceptance subscale. The frequency and severity of pain in patients with migraine explain 24% of the variance in disability.

The limited number of studies examining the relationship between migraine, emotion, and emotion regulation, yield different results. A study conducted with adolescent women found that migraine patients experienced more alexithymia, negative affection, rumination, and catastrophizing and were also less successful in cognitive reassessment [17]. Haratian et al. (2020) examined ERD in their study with patients with primary headaches and healthy volunteers, finding that patients with headaches had more recurrent negative thoughts than the control group. Those with tension-type headaches also experienced more ERD than migraine patients [9]. These results are in accord with our findings that migraine patients experience more ERD. In contrast, Perozzo et al.'s (2005) study concluded that individuals with migraines exhibited superior emotional coping abilities and lower levels of anger compared to individuals with other primary headaches and healthy controls [18]. Wolf et al. (2020) conducted a study on migraine patients from different cultures, finding no relationship between headache and emotion regulation [19]. Migraine, being a pathology that persists even in episodic attacks, the variability of its prognosis, and the disruption of quality of life due to accompanying clinical symptoms cause negative emotions in individuals. It is thought that the increased ERD in migraine patients is also related to these negative experiences. Migraine is a common pathology in which loss of ability is considered a public health problem due to the resulting socioeconomic losses. For this reason, it is essential to determine the clinical variables that may be related to the disability. A study conducted showed that migraine sufferers who experience disability have more frequent attacks, and the attacks they experience are more severe [20]. A study conducted in Turkey found that the most critical determinants of disability are the frequency and severity of attacks [10]. Our research aligns with existing literature in identifying two primary factors that contribute to disability in individuals with migraines: the frequency and severity of attacks. It is believed that an increase in the frequency and severity of pain attacks can significantly diminish an individual's quality of life, reduce their overall functionality, and further worsen their level of disability.

When the factors that trigger a migraine attack were examined in the study, it was found that patients were most often affected by emotional changes. Similarly, studies in the literature determine the relationship between emotional change and attacks [21, 22]. According to the information obtained here, it was thought that the presence of ERD against the emotional changes might be related to disability, but no relationship (r=.021) was found. Similar to our study, Wolf et al. (2020) showed that emotion regulation skills are not associated with quality of life in migraine patients [19]. Chan and Consedine (2014) determined that the inability to manage negative emotions in migraine patients causes difficulties in coping with the disease and reported that this may be related to disability [23]. There is no publication in the literature reporting that ERD is associated with disability in migraine patients. However, studies conducted on certain painful conditions, such as rheumatoid arthritis and fibromyalgia, have found that difficulties in emotion regulation (ERD) can impair patient functionality [12, 13]. Our research did not establish a clear link between ERD and disability, which led us to consider two potential explanations. The first possibility is that the heterogeneous and variable nature of migraines, as well as the unique characteristics of our sample, may have influenced this lack of relationship. Secondly, while ERD may contribute to emotional changes in individuals with migraines, it may not be a strong enough factor to significantly impact their overall level of disability. In our study, when the patients' scores on the DERS-16 and its subscales were analyzed according to their disability levels, it was found that only patients with 1st-degree disability in the refusal subscale got significantly higher scores than patients with 4th-degree disability. It was thought that this might be related to the fact that patients with more disabilities accept the disease and develop appropriate coping mechanisms.

Study Limitations

This study has several limitations. First, it was conducted at a single center, which limits the generalizability of the findings to other populations. Second, the sample size was relatively small, which reduces the power of the study to detect statistically significant relationships. Third, the study did not classify participants according to migraine subtypes, which may have obscured significant differences in the relationship between migraine, ERD, and disability. Future studies with larger sample sizes and classification of participants according to migraine subtypes are needed to confirm and extend the findings of this study.

Conclusion

Migraine is a complex neurological condition with a significant impact on quality of life, functional capacity, and disability. While the impact of mood changes in migraines is well-established, the role of emotional regulation difficulties (ERD) is a relatively new area of research. ERD is characterized by impairments in the ability to recognize, express, and manage emotions. It is hypothesized that ERD may play a role in the clinical manifestations of migraine and its association with disability. However, more research is needed to confirm these hypotheses, with larger sample sizes and representation from diverse settings. The findings of these studies could have important implications for the prognosis and management of migraine.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and Human Rights Statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or compareable ethical standards.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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